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November 18, 2001

William E. Muno, Director
Superfund Division
U.S. EPA – Region 5
77 W. Jackson Blvd.
Chicago, IL 60604-3590

RECEIVED

SUPERFUND DIVISION
OFFICE OF THE DIRECTOR

Re: Wisconsin Steel Works – boat slips
USS South Works – boat slips

Dear Mr. Muno:

Thank you for your letter detailing the work completed by U.S. EPA and Illinois EPA that characterizes the nature and extent of contamination in the boat slips of the Wisconsin Steel and South Works sites.

I am writing to ensure that the following information informs your deliberations about the next steps in this process. While I am grateful for the extensive sampling work completed in response to the 9605(d) Petition, I am concerned that a migration/exposure pathway for contaminants originating in these boat slips requires further attention.

Three different reports, issued over a 25-year period, raise concerns that water contamination originating in the Calumet River and Harbor could affect the quality of Lake Michigan.

In 1965, researchers from the U.S. Health, Education and Welfare agency conducted a study of wind patterns offshore of Southeast Chicago. This area of Lake Michigan is characterized by wind patterns from the Southwest. This wind pattern indicates that water discharges from the Calumet area can be transported north and west in Lake Michigan along the Illinois shoreline. U.S. Department of Health, Education and Welfare (USHEW), 1965. Report on Pollution of the Waters of the Lake Calumet River, Little Calumet River, Calumet River, Lake Michigan, Wolf Lake and Their Tributaries, Illinois-Indiana. Division of Water Supply and Pollution Control, Region V, Chicago, Illinois.

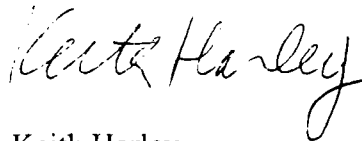
In 1975, researchers used information about wind and water circulation patterns in Lake Michigan to simulate the activities of pollutants discharged at the Calumet Harbor. Within six days, a pollutant “slug” was shown to occupy the surface layers of the Illinois portion of Lake Michigan, an area that includes drinking water intake and filtration facilities. Within 32 days,

most of the southern basin of Lake Michigan was affected. Katz, P.L. and G.M. Schwab, 1975. Modeling Episodes in Pollutant Dispersion in Lake Michigan. University of Illinois Water Resources Research Report 97, Champaign, Illinois.

In 1990, two researchers from the Illinois State Water Survey, William Fitzpatrick and Nani Bhowmik, reviewed the relationship between the hydrology of the Greater Lake Calumet Area and Lake Michigan, including information demonstrating that the O'Brien Lock functions in many circumstances to flush the Calumet River into Lake Michigan. They concluded that "...contamination of water resources is continuing and may pose a threat to water resources and humans." The researchers were unable to provide assurance that the Lake Calumet surface waters were not harming the valuable waters of Lake Michigan.

To aid in your review of this critical interconnection between contaminants in the Calumet River and Harbor and Lake Michigan, I am attaching the cover and several pages from the Fitzpatrick and Bhowmik report as well as a bibliography about the hydrogeology and hydrology of the Calumet area. I request this information inform your subsequent efforts to ensure the sediments in these boat slips no longer pose an uncontrolled release of contaminants into surface waters.

Sincerely,

A handwritten signature in cursive script that reads "Keith Harley".

Keith Harley
Attorney at Law

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SURFACE WATER AND CONTAMINANT MOVEMENT

Surface Water Flow Patterns

Figure 4 illustrates the principal rivers, lakes, and wetlands of the greater Lake Calumet region. This area is drained by three major rivers: the Calumet, Little Calumet, and Grand Calumet. The flow to a certain extent is controlled by the O'Brien Lock and Dam located approximately one-half mile north of the junction of the Little Calumet and Grand Calumet Rivers. The lock and dam were constructed to divert the flow of the Little Calumet and Grand Calumet Rivers away from the Calumet River and to reduce pollution discharges into Lake Michigan. The diverted water flows west in the Little Calumet and empties into the Cal-Sag Channel, which conveys it into the Des Plaines/Illinois River Basin.

The rivers of the region have very flat gradients and are subject to frequent flooding. In addition, channelization of the rivers and their tributaries and the presence of large impervious urban areas have aggravated flood drainage problems in the area.

Typical flow conditions in the region can be grouped into the four categories in Figure 5, which shows the typical low-flow drainage pattern of the area. Lake Calumet and Wolf Lake drain into the Calumet River, which flows north into Lake Michigan. The other rivers are diverted by the lock and dam away from the Calumet River and toward the Cal-Sag Channel.

The flat gradient of the Calumet River allows the river to reverse flow direction away from Lake Michigan during periods of high local lake level (i.e., following wind set-up, where winds over the lake pile water on the southern shore, or during periods of elevated levels on the Great Lakes). The effects of wind set-up on the regional flow pattern are shown in Figure 5b, where water flows south in the Calumet River and into Lake Calumet and Wolf Lake.

The effects of a moderate rain storm on the regional drainage pattern are shown in Figure 5c. The relatively undersized sewer system overloads 100 times per year on the average (City of Chicago, 1976) and the combined storm and sanitary sewers discharge waste into the waterways. The City of Chicago (1976) estimates that sewer overflows account for 45% of the total pollutants delivered to the rivers of the area. The result of these

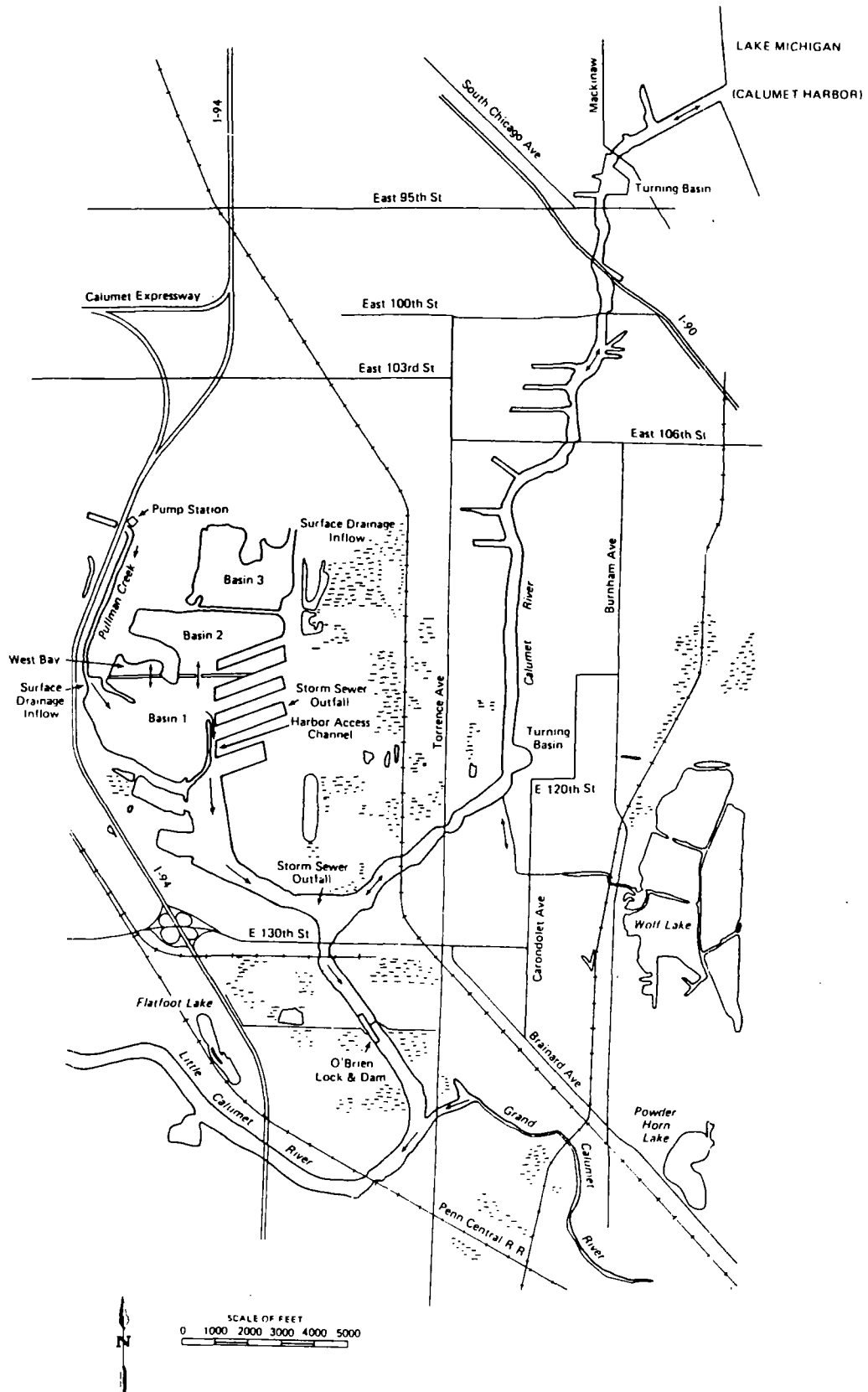


Figure 4. Greater Lake Calumet region

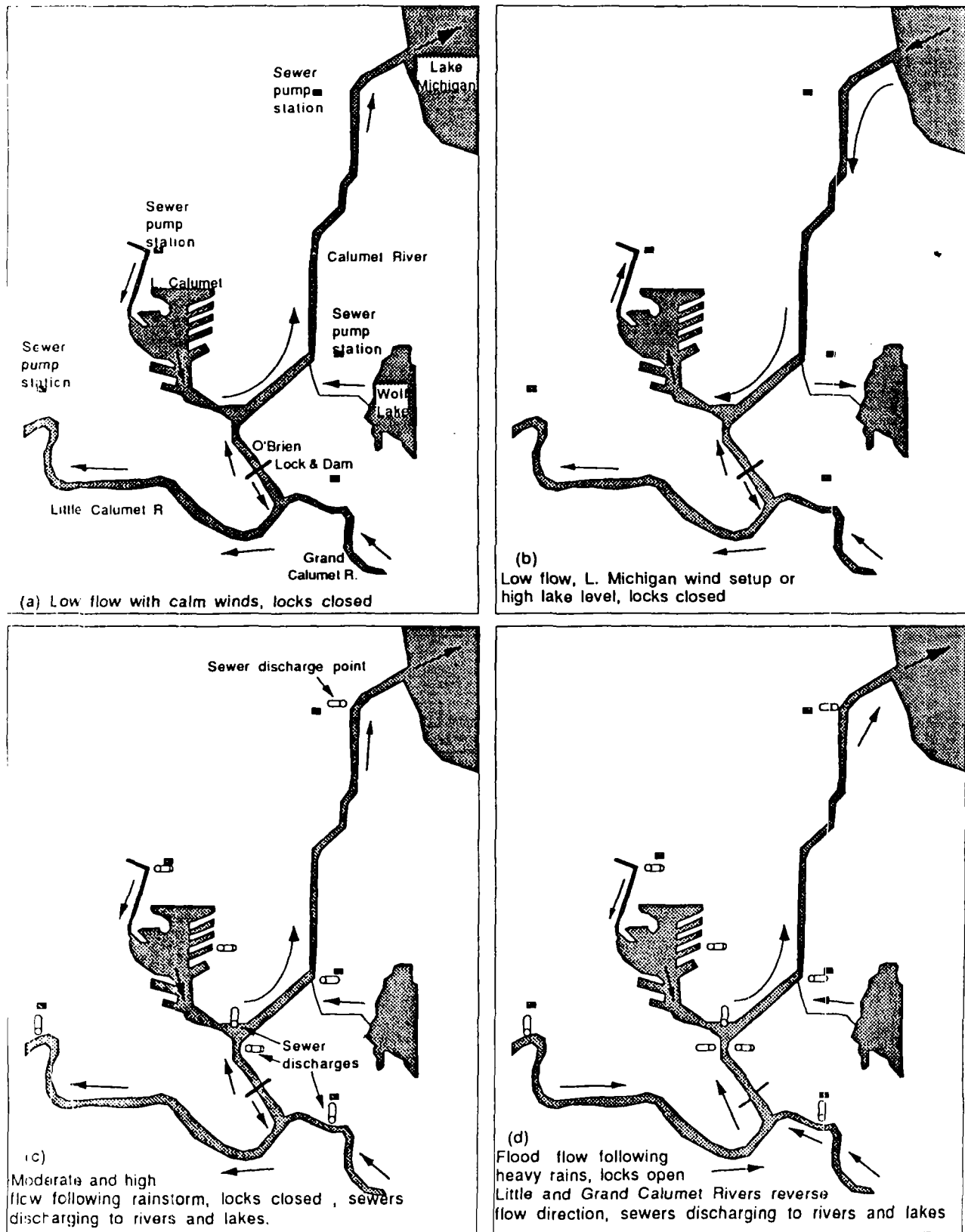


Figure 5. Typical flow patterns in the greater Lake Calumet region

overflows is that raw sewage is discharged into Lake Michigan nearly one-third of the days of the year.

Figure 5d shows the effects of a heavy rainstorm on the flow directions of rivers in the area. The principal difference between moderate and heavy storm events is that the lock on the Calumet River is opened to reduce flooding to the south in the Little Calumet and Grand Calumet Rivers. These rivers convey sewage from overloaded systems throughout the southern portions of Chicago and adjoining suburbs into the Calumet River and then into Lake Michigan.

Flow Into Calumet Harbor and Lake Michigan

Water and contaminants discharged into Calumet Harbor (see Figure 4) are transported into Lake Michigan because of lake circulation patterns generated by the prevailing winds. Data on circulation patterns collected by USHEW (1965) show a strong northerly current pattern from within Calumet Harbor to the southwestern basin of Lake Michigan. Obviously these current patterns shown in Figure 6 affect water quality at the Wilson Avenue, Carter H. Harrison, Four Mile, 68th Street and Hammond, Indiana water intake cribs.

Katz and Schwab (1975) used a mathematical simulation technique to assess the effects of pollution discharge at Calumet Harbor on Lake Michigan. A slug of simulated materials discharged into Calumet Harbor for a 24-hour period was shown to occupy the southwestern basin of Lake Michigan (top layer) after about 32 days (see Figure 7). This simulation and field data collected by USHEW (1965) indicate that pollutants discharged into Calumet Harbor can travel throughout the southwestern basin of Lake Michigan and contaminate public water supplies.

A thorough and comprehensive evaluation of the water and pollutant transport patterns from within the greater Lake Calumet region through the Calumet River to Calumet Harbor and then to the southern basin of Lake Michigan is not only imperative but also essential to develop and implement a comprehensive management plan for this highly disturbed environment.

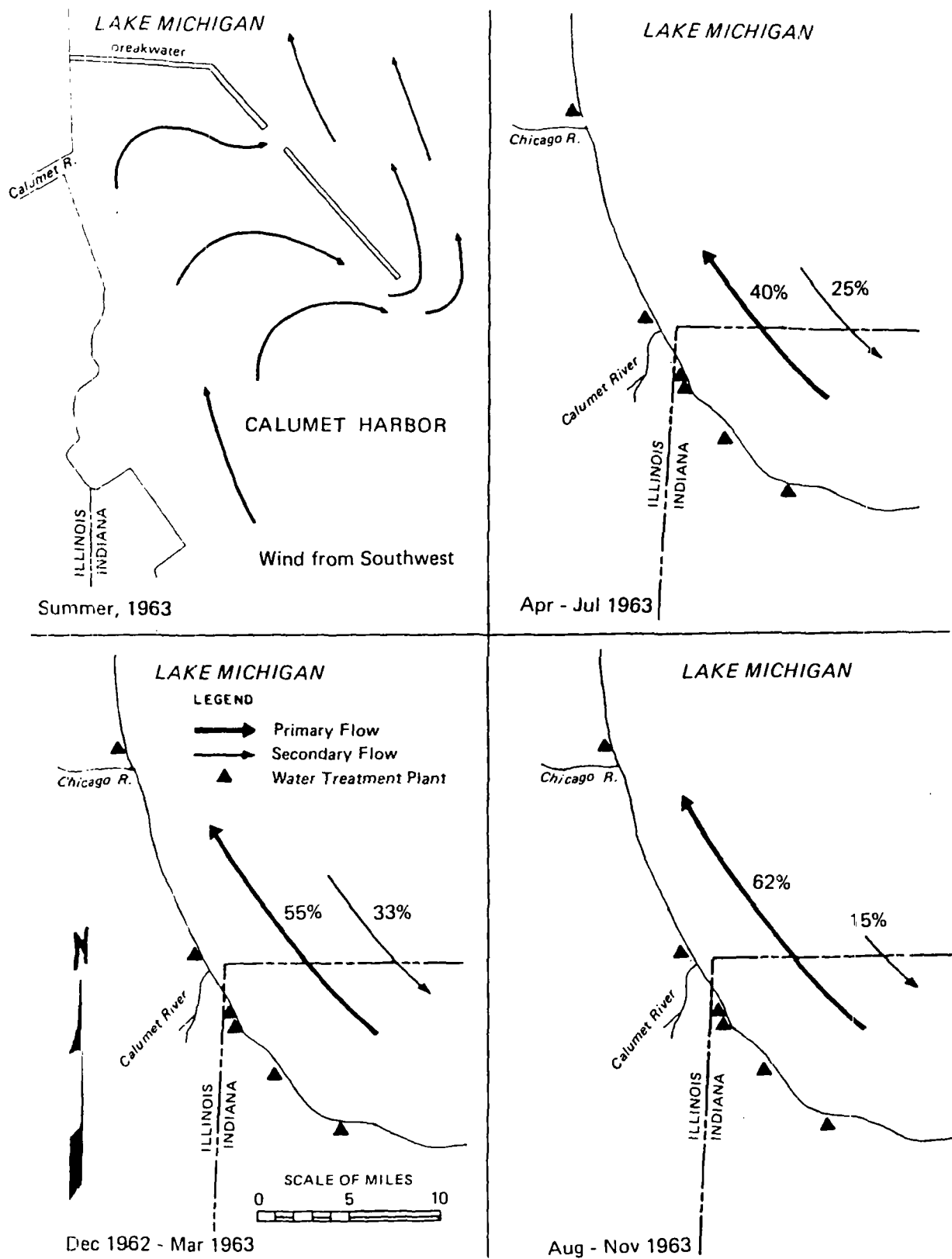


Figure 6. Current patterns in Calumet Harbor and the southern basin of Lake Michigan (after USHEW, 1965)

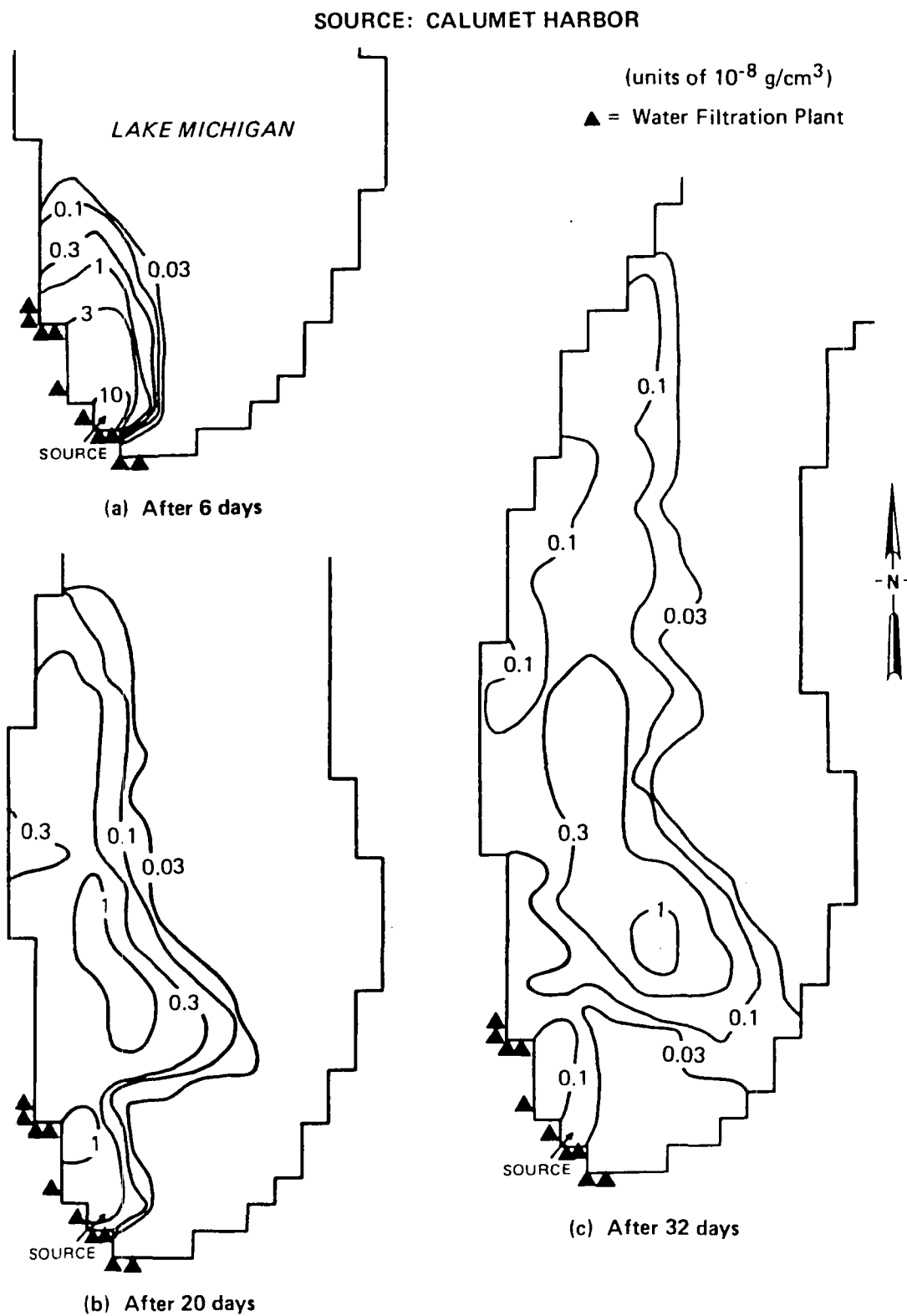


Figure 7. 33 day episode simulation of a pollution slug input in Calumet Harbor (after Katz and Schwab, 1975)

CONCEPTUAL MODEL OF SURFACE HYDROLOGY AND CONTAMINANT TRANSPORT

Conceptual Model of Streamflow in the Greater Lake Calumet Region

Flow direction in the rivers of the region is influenced by storm drainage, Lake Michigan's water level, and flood control measures. Figure 8 is a conceptual model of flows in the greater Lake Calumet region. In this figure it can be seen that the interrelationship of the various lakes and rivers is complex and changes according to low- or high-flow conditions. A key component of the model is the function of the O'Brien Lock and Dam which isolates the drainage of the Little Calumet and Grand Calumet Rivers from Lake Michigan. The lock and dam is used in periods of low flow to divert the drainage of these rivers away from the lake and toward the Des Plaines/Illinois River Basin to keep the pollutant loads of these rivers out of the lake. However, the relatively low gradients of the rivers necessitate the opening of the lock to prevent severe flooding problems in the region with the result that the combined drainage of the Calumet, Little Calumet, and Grand Calumet Rivers discharges into Lake Michigan.

Another key feature of the model shown in Figure 8 is the regional sewer system, which is capable of handling low-flow runoff and sanitary flow during dry periods but overloads and spills into most of the nearby rivers and lakes during high-flow periods. Local sewers discharge into Lake Calumet, the Little Calumet, Grand Calumet, and Calumet Rivers, and the Cal-Sag Channel. It can be seen that during high flow the combined discharges and pollutant loads of the rivers and sewers of the region can empty into Lake Michigan. This model illustrates the complex regional surface water flow patterns in the area.

A Conceptual Model for Surface Water Contaminant Movement

The conceptual model for flows shown in Figure 8 forms the basis for the development of a conceptual model for the movement of contaminants/sediments in this region. Most of the contaminants transported in the region will move either as dissolved materials or as particulate matter within the water. Thus, moving water serves as an important vehicle in the transport, deposition, and redistribution of contaminants and sediment. The conceptual model shown in Figure 9 indicates the overall pattern of

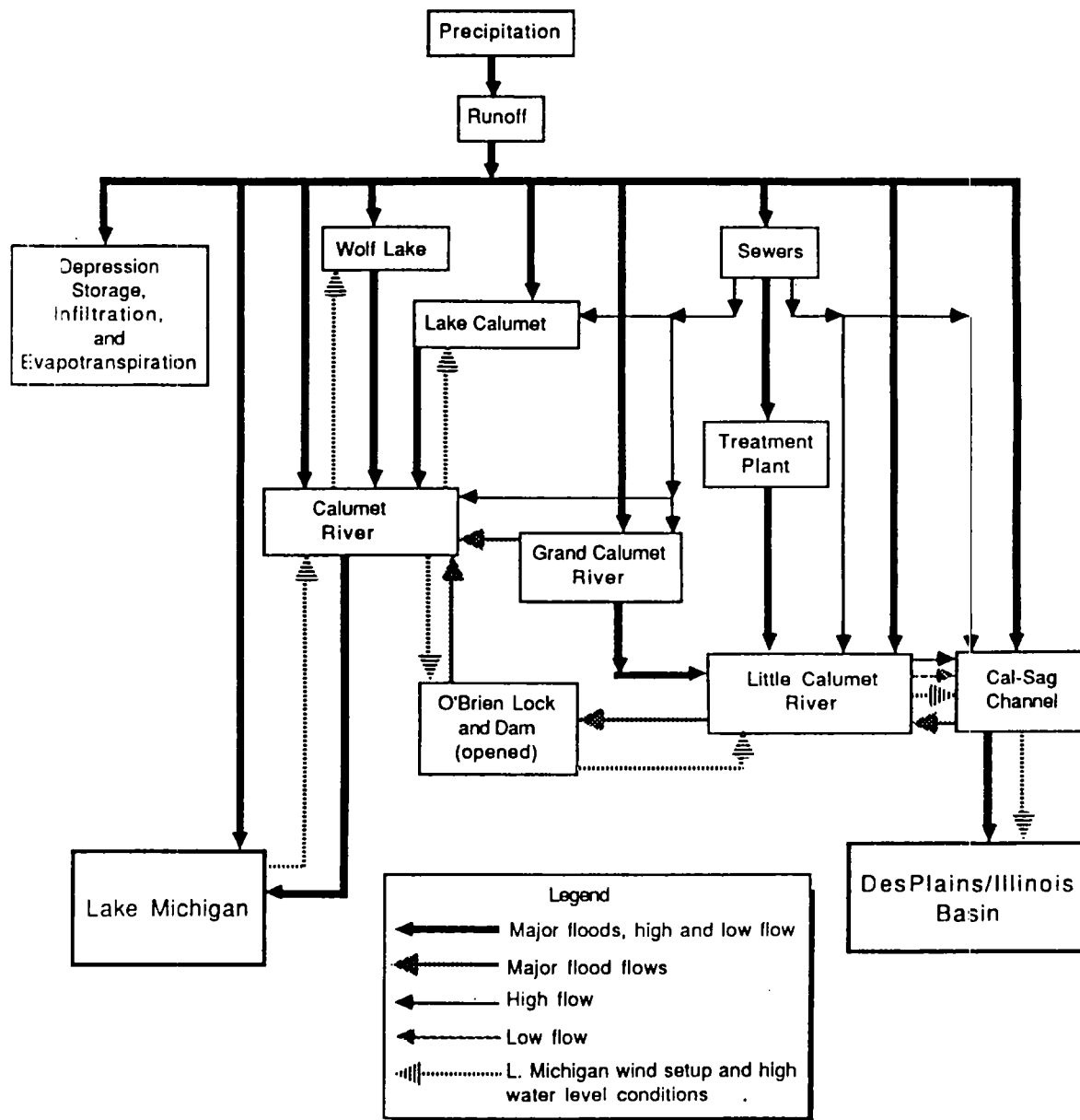


Figure 8. Conceptual model of runoff in the greater Lake Calumet region

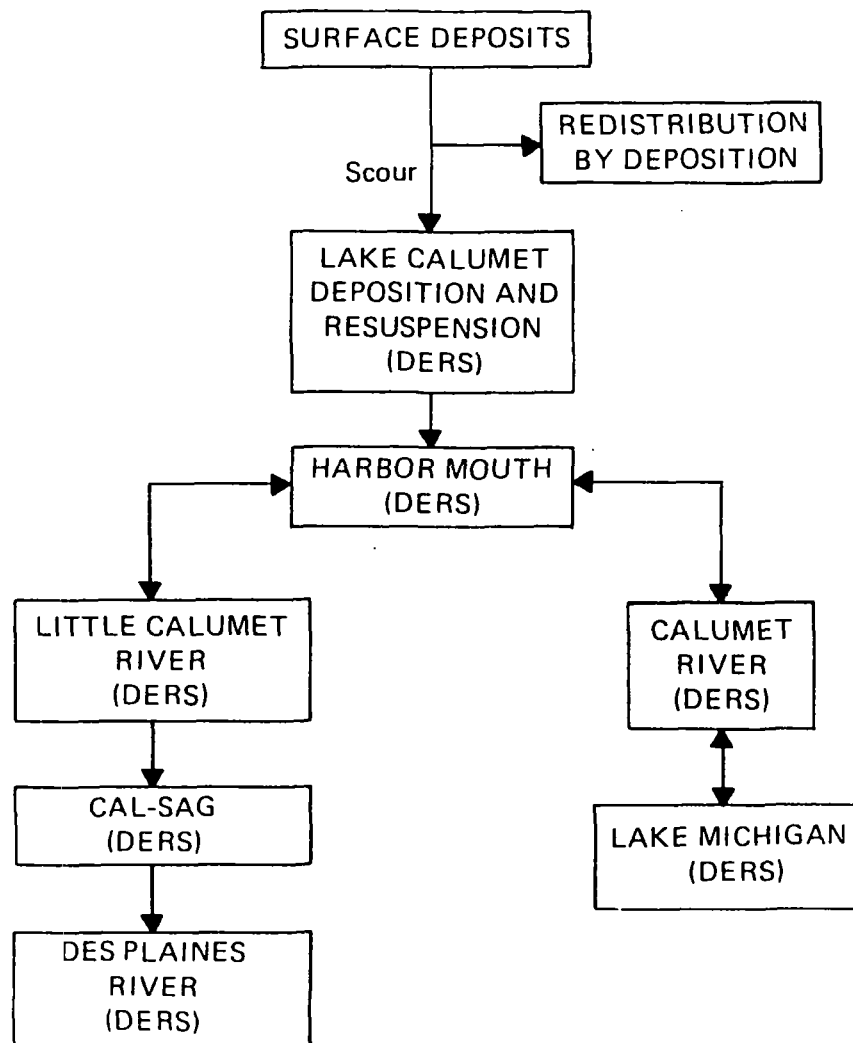


Figure 9. Conceptual model of contaminant movement with surface runoff and streamflows from Lake Calumet

scour, resuspension, and deposition of contaminants and sediments within this environment, especially those originating in the Lake Calumet area.

Movement and Deposition of Contaminants Within Lake Michigan

Southern Lake Michigan is subjected to extreme stresses because of its proximity to large municipalities and industrial centers and because of the input it receives from agricultural and industrial watersheds (Bell, 1980). A number of important studies have been conducted on Lake Michigan, but almost all of them were concerned with the open lake or with a specific area or problem. They did not consider the problems of near-shore areas, nor compare them with the problems of other areas or the open lake. An in-depth comparison between the near-shore input from tributaries (such as the Calumet River) and the open lake area will enable recreation managers, public officials, and resource planners to develop and initiate a well-thought-out plan to manage this resource.

A thorough review of available literature indicated that a number of studies on input of atmospheric pollutants into Lake Michigan have been conducted over the years (USHEW, 1963d; Murphy and Rzeszutko, 1977; Eisenreich, Emmling, and Beeton, 1977; Hicks, 1977; Doskey and Andren, 1981; Hesse and Hallenbeck, 1978; Fingleton and Robbins, 1980; University of Wisconsin Sea Grant Program, 1980). Most of these investigations were concerned with specific pollutants or trace metals and a quantification of their input into the lake. Research such as that by Rossmann (1980a, b), Quigley and Robbins (1984), Parker et al. (1982), Bell and Eadie (1983), Eadie et al. (1984), Lauritsen, Mozley, and White (1985), and McCown et al. (1978) was also conducted to determine the resuspension and transport of sediment and associated pollutants by Lake Michigan waters. However, an extremely limited number of research projects have been conducted to determine the loadings of pollutants from tributary streams, especially those discharging from the Illinois and Indiana shores of Lake Michigan. Among these research projects only the work of Dolan, Yui, and Geist (1981), Romano et al. (1977), Robbins, Landstrom, and Wahlgren (1972), and Monteith and Sonzogni (1981) deals with the loadings to Lake Michigan from its tributary streams. Romano et al. (1977) indicated that about 40 tons of filterable Zn and 121 tons of filterable Fe are discharged into Lake Michigan from the Grand Calumet River. They believed that the

Calumet River system is a major source of fluvial metals in Lake Michigan. An older report by USHEW (1965) also deals with the pollution loads of the Calumet River Basin in both Illinois and Indiana.

An estimate of the depositional rates and mineralogical characteristics of the sediment in southern Lake Michigan was done by Rea, Bourbonniere, and Meyers (1980). The U.S. Army Corps of Engineers (1983) has also analyzed the pollutant content of the bed sediments of the Little Calumet River in Illinois.

Cahill (1981) reported and reviewed the extensive research conducted by various researchers on the geochemical characteristics of the bottom sediments in Lake Michigan. Arsenic, lead, bromine, copper, chromium, mercury, zinc, and organic carbon have been shown by Shimp et al. (1971) to be accumulating elements in southern Lake Michigan. An association between these elements and the high organic content of the sediment has been postulated by these authors, with the implication that human activities are responsible for these elevated levels. Cahill (1981) also reported an extremely high correlation between the abundance of most elements, such as Br, Cr, Cu, Pb, and Zn, and the clay-sized fraction and the organic carbon content of the sediments. Kemp (1971) reported a direct proportionality between the organic carbon content and clay-sized fraction of sediments in Lakes Erie, Ontario, and Huron. Leland, Shukla, and Shimp (1973) reported that suspended materials in Lake Michigan may contain as much as 30 to 40% organic materials.

This review indicates that very little research has been conducted to determine the relative contribution of the pollutant loads by the tributaries in the southern Lake Michigan basin. The abundance of various elements in sediments of the southern basin may imply a source or sources in the vicinity of the depositional area. Moreover, it is certain that the particle-size characteristics of the sediment load and its organic carbon content play a vital role in the transport and depositional mechanism of various elements.

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